Washington, D.C. 20505

Executive Registry
77-1604/3

30 JUN 1977

Dear Mr. McCone:

In response to your request for background information on fast breeder reactor programs in selected foreign countries, I am pleased to forward the attached. You will note that it is all basically unclassified. However, I'm sure you do not plan to use it with any attribution to CIA.

When your plans for visiting Washington become firm, I hope you will let me know, especially if there are matters of mutual interest which we might discuss. Since we last met, there have been some interesting developments in the future structure of the intelligence community.

With warm personal regards,

Yours sincerely,

/s/ Stansfield Turner

STANSFIELD TURNER

Enclosure

Mr. John A. McCone

STAT

EXECUTIVE REGISTRY FILE McCone/DCI

Approved For Release 2004/02/23 : CIA-RDP80M00165A002600040002-1

FRENCH FAST BREEDER PROGRAM

Status of the Program

The fast breeder reactor concept being developed in France is similar to that which is under development in all the other major breeder reactor programs of the world--the liquid-metal-cooled, fast-breeder reactor concept. After 20 years of research and development France has an experimental fast reactor called Rapsodie, a 250-MWe demonstration fast breeder reactor plant called Phenix, nearly 4 years old, and a 1200-MWe commercial prototype called Super Phenix, now under construction. The Super Phenix commercial prototype is expected to be completed in 1983.

A 450-MWe version of Phenix also has been designed. It is intended for export and will not be built unless a customer is found.

France also is developing and building the facilities required to fuel its fast breeder reactors--facilities for fuel fabrication, transportation, and reprocessing--which call for more sophisticated technology than is currently available, primarily because of the large amounts of plutonium involved. At this time, France has not progressed beyond the pilot stage in these areas but expects to have

the technology well in hand by the time Super Phenix has operated.

The experience gained with the Phenix demonstration plant has made France the world leader in the fast breeder reactor field. It is Super Phenix, however, that will determine whether the French technology can be applied commercially. Certain features of the Phenix plant that are acceptable for developmental systems would not be commercially feasible. In particular the development of a commercial steam generator, which has caused the most difficulty in the British and Soviet programs, will not be proven until Super Phenix operates successfully.

<u>Goals</u>

France intends to expand its nuclear power generating capacity as rapidly as possible and believes that the use of light-water reactors is limited by the associated uranium production and enrichment requirements. The French therefore plan to switch over from the pressurized-water reactors now being built to fast breeder reactors, starting in the 1980s. By 1990, as much as 10,000 MWe is to be available from fast breeder reactors.

An industrial group has been organized in France to build these advanced reactors, but the domestic market will not provide sufficient demand. Just as France now competes for international sales of pressurized-water

reactors, in the future; France intends to export fast breeder reactors.

Remaining Problems

If Super Phenix operates successfully--and there is no reason to think that it will not--then France probably will encounter no serious technical problems in moving to a commercial phase. The first few breeder reactors, those built before 1990, almost certainly will have to be subsidized, but breeder plants built in the 1990s and later apparently are expected by the French to compete well with pressurized-water reactors.

WEST GERMAN FAST BREEDER PROGRAM

Status of the Program

West Germany is well behind France, the UK, and the Soviet Union in the development and construction of fast breeder reactors. An experimental reactor is only now being configured for fast neutron operation; West Germany previously has made use of foreign research reactors. Meanwhile, construction has been underway for 4 years on a demonstration plant called SNR-300 (300-MWe Fast Sodium-cooled Reactor).

Construction of this plant has been continually hindered by licensing requirements, which have gradually become more stringent since the design was fixed in 1973. All essential equipment for the SNR-300 has been ordered and is being fabricated, and the plant is expected to become operational in 1982.

West Germany originally planned to build a large commercial prototype soon after successful operation of the SNR-300. This prototype called the SNR-2, was to be partially financed by French and Italian concerns, just as the French Super Phenix is being built for a company that is 51% French, 33% Italian, and 16% West German. Recent developments apparently have led West Germany to reconsider, however.

The West German government has temporarily halted funding for the advanced prototype, undoubtedly influenced by increasing public concern over the nuclear program in general; in recent months that concern has erupted with startling violence. In addition, West Germany has agreed to coordinate its development and sales of fast breeder reactors with France. The two countries currently are working out the legal arrangements under which this cooperation is to proceed; West Germany is expected to benefit by French technology while France is expected to benefit from access to the West German market and from a strengthened position as a potential exporter of fast breeder reactors. The West German government may thus feel that construction of the SNR-2 can be postponed until public opposition subsides.

Development of fuel fabrication technology and fuel reprocessing technology in support of the fast breeder remains in an early stage. No pilot facilities are under construction.

Goals

West Germany is eager to reduce its fossil fuel imports by expanding its domestic nuclear power generating capacity. With no significant proven reserves of uranium, however, the West German government does not wish to swap

dependence on oil suppliers for dependence on uranium suppliers. Thus, West Germany has pursued the development of fast breeder reactors. At this point in the program, no time schedule has been determined for the introduction of commercial fast breeders into the power grid.

<u>Remaining Problems</u>

West Germany has the technical expertise to perfect a fast breeder reactor design and to build commercial plants by 1990. For the near term, however, technical problems are overshadowed by political uncertainties. In particular, conventional reactor construction in West Germany can now proceed only if the customer can demonstrate that arrangements have been made to dispose of the associated spent fuel; a similar constraint may be imposed on the fast breeder reactor program. Such a constraint would be a great hinderance to the fast breeder program. Little information and experience exists, in West Germany or elsewhere, concerning the technical and safety problems caused by repeated recycling of fast breeder reactor fuel. The reactor development program would thus be delayed for many years until the associated fuel cycle technology evolved.

UNITED KINGDOM

Status

In 1963, the United Kingdom (UK) began operation of a 15 MW electrical, demonstration fast breeder reactor (FBR) located at Dounreay. This reactor demonstrated the feasibility of fast reactors with liquid metal cooling, as well as serving as an irradiation facility for testing fuels and other materials. After some start-up problems, the reactor operated successfully for several years and has since been shut down.

A prototype FBR, also located at Dounreay, began operation in 1974 but has never reached full power at the design level of 270 MW electrical. Problems have mainly been with leaks in the steam generators. Contributing to this problem is a lack of adequate test facilities for full scale tests of large components. The reactor is, however, an impressive engineering accomplishment and, in some respects, more nearly approaches a realistic commercial plant design than the French Phenix reactor.

A fuel fabrication plant at Windscale provides mixed plutonium/uranium oxide fuels for the British program. A reprocessing plant built at Dounreay for the fuel from the FBR is being reconstructed to reprocess the plutonium fuel from the prototype reactor.

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Goals

The UK's next step would have been the construction of a 1400 MW electrical, commercial FBR, but recent debate on commercialization of FBRs will probably defer a firm decision to build such reactors until at least 1979.

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JAPAN

Status

Fast breeder reactor (FBR) development in Japan began in 1962 under the auspices of the Japan Atomic Energy Research Institute (JAERI). In 1968 the Power Reactor and Nuclear Fuel Development Corporation (PNC) was formed and immediately assumed responsibility for FBR development. Construction of a 100 MW thermal, experimental FBR named JOYO began in 1970 at PNC's Oarai Engineering Center. In April 1977 JOYO became operational at a power level of 50 MW thermal, thus making Japan the fifth country to have a working FBR.

In support of the FBR program, PNC's Tokai Works began development of plutonium fuels at its Plutonium Fuel Development Facility (PFDF) in 1966 and later built the Plutonium Fuel Fabrication Facility (PFFF) which has produced mixed-oxide fuel for the Deuterium Critical Assembly, the advanced thermal reactor, FUGEN, and the FBR JOYO. These plutonium fuel fabrication facilities are considered to be among the best in the world. The PNC also has extensive facilities at Oarai for testing FBR components as well as facilities for monitoring spent fuel

from JOYO. The major nuclear industrial groups in Japan have also established specialized FBR component testing and manufacturing facilities.

Japan's FBR program is based on sodium cooling and has been aided by technological exchanges with France and the United States. Although no really innovative changes have been observed in the Japanese program, they have spent a lot of time and effort on fuel and component development. Thus, their program is probably as good as any other, but it got a late start and is proceeding more slowly than programs in some other countries.

Goals

Japan considers nuclear power to hold the most potential as a future energy source, and the FBR has been chosen to most fully utilize the limited uranium resources in the world. A 300 MW electrical, prototype FBR, MONJU, has been designed, and construction is scheduled to begin at Tsuruga by 1979. Start of construction has been delayed by siting and budgetary problems, but it is now hoped that the plant can be operational in 1984. A demonstration plant of 800-1200 MW electrical will probably follow the successful operation of the MONJU plant. Eventually Japan hopes to gradually replace its light-water reactors by commercial FBR's.

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17 June 1977

The Soviet Liquid-Metal Fast Breeder Reactor Program

I. The Soviets are actively developing the liquid-metal fast breeder reactor and have a prototype reactor in operation. A large commercial-scale reactor will not be in operation, however, before at least the late 1980s.

A. The prototype liquid-metal fast breeder reactor went into operation in 1973 at Shevchenko on the Caspian Sea. The capacity of the reactor is 350 MWe, but the steam equivalent of 200 MWe is used for the desalination of water from the Caspian.

1. The reactor has suffered from a number of problems, including inadequate steam generator design and testing, inadequate reactor core design, and poor instrumentation.

2. Of greater consequence, however, was the series of failures in the steam generators. These non-nuclear failures are attributed to faulty materials, poor welding, and inadequate quality control.

3. The Soviets are actively seeking Western steam generator technology through the US/USSR Fast Breeder Reactor Exchange Program. They have even volunteered to test one or two of the US manufactured prototype steam generators for the Clinch River Fast Breeder Reactor Plant on their prototype reactor.

B. A 600 MWe liquid-metal fast breeder reactor of different design is under construction at Beloyarsk. This reactor probably will not be completed before 1979.

C. The Russians have tentative designs for a large (1,000-1,600 MWe) commercial-scale liquid-metal fast breeder reactor. These designs probably will not be completed until the 600 MWe reactor has been in operation for at least a year. As a result, construction of such large reactors will be delayed until at least 1980; completion is scheduled for the late 1980s.

D. The Soviets believe that the liquid-metal fast breeder reactor is absolutely essential for the rational utilization of overall fuel resources. They maintain that the reactor will extend the energy potential of world uranium reserves by at least 30-50 times in comparison with the use of light water reactors.

TRANSMITTAL SLIP

TO: NFIB (Walt Elder)

ROOM NO. | BUILDING

REMARKS:

Please prepare personal note from DCI to Mr. McCone which you can give to McCone when you pass him the paper.

FROM: A/DCI —

ROOM NO. | BUILDING | EXTENSION

FORM NO. 241 1 FEB 55 — REPLACES FORM 36-8 WHICH MAY BE USED. (47)

REGISTRY FILE McCone DCI bf

DIRECTOR OF CENTRAL INTELLIGENCE

Executive Registry
77-1604/2

23 JUN 1977

I'd prefer to send
to Mr. McCone
over my signature
with warm personal
note

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FORM NO. 237 Use previous editions
1-67

USGPO: 1976 — 202-953

DDI # 2421-77

23 JUN 1977

Executive Registry
77-1604/1

MEMORANDUM FOR: Executive Secretary, PRC (Intell)/
NFIB

SUBJECT : Fast Breeder Reactors

REFERENCE : Your memorandum, DCI/IC 77-4576,
dated 13 June 1977

The attached information on fast breeder reactor programs in France, West Germany, Japan, the United Kingdom and the Soviet Union may be passed to Mr. John A. McCone for use in his appearance before the House of Representatives Committee on Science and Energy.

/s/ Stansfield Turner

STANSFIELD TURNER

Attachment:
as stated

STAT

CONCURRENCE:

17 JUN 1977

Acting Director of Scientific Intelligence — Date

STAT

20 JUN 1977

Deputy Director for Intelligence — Date

Approved For Release 2004/02/23 : CIA-RDP80M00165A002600040002-1

SUBJECT: Fast Breeder Reactors

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17 June 1977

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Remarks:

2 to 4:

Mr. John McCone has asked for information on fast breeder reactors to prepare him to testify before the House of Representatives Committee on Science and Energy. We have put together this package of information on this subject for you to transmit to the Executive Secretary, PRC [redacted]

AT

will pass it to [redacted]

Sayre Stevens

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FROM: NAME, ADDRESS AND PHONE NO.	DATE
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DCI/IC 77-4576
13 June 1977

MEMORANDUM FOR: Director of Central Intelligence

FROM: Walter Elder
Executive Secretary, PRC (Intell)/
NFIB

SUBJECT: Fast Breeder Reactors

1. Mr. John A. McCone has accepted an invitation from the House of Representatives Committee on Science and Energy to testify on the subject of fast breeder nuclear reactors as a future fuel source.

2. Mr. McCone, who pioneered the development of the fast breeder reactor, has asked ERDA to provide him background from his AEC files on the status of the U.S. effort in this field.

3. He has asked if CIA could provide him background information, unclassified if possible, on the status of fast breeder reactors in the United Kingdom, France, West Germany, and the Soviet Union.

4. If you have no objection, I'll get the information from CIA.

STAT [redacted]

Walter Elder